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PART II

DEPARTMENT OF ENERGY

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WATER HEATERS, HOME HEATING EQUIPMENT (NOT INCLUDING FURNACES), KITCHEN RANGES AND OVENS, CLOTHES WASHERS, AND FURNACES

Final Energy Efficiency Improvement Targets

[3128-01-M]

Title 10—Energy

CHAPTER II—FEDERAL ENERGY ADMINISTRATION[1]

PART 430—ENERGY CONSERVATION PROGRAM FOR APPLIANCES

Energy Efficiency Improvement Targets for Five Types of Appliances

AGENCY: Department of Energy.

ACTION: Final rule.

SUMMARY: This rule prescribes final energy efficiency improvement targets for water heaters, home heating equipment (not including furnaces), kitchen ranges and ovens, clothes washers, and furnaces. Energy efficiency improvement targets are one element of the consumer product efficiency program required by the Energy Policy and Conservation Act.

EFFECTIVE DATE: November 13, 1978.

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SUPPLEMENTARY INFORMATION:

I. Background

On October 1, 1977, the Department of Energy (DOE) assumed the authority of the Federal Energy Administration (FEA) for the energy conservation program for appliances, pursuant to section 301 of the Department of Energy Organization Act (DOE Act) (Pub. L. 95-91). The energy conservation program for appliances was established by FEA pursuant to title III, part B of the Energy Policy and Conservation Act (Act) (Pub. L. 94-163). Section 325 of the Act, as amended by section 161 of the Energy Conservation and Production Act (Pub. L. 94-385), requires that energy efficiency improvement targets be prescribed for certain types of covered appliances, specifically:

(1) Refrigerators and refrigerator-freezers.
(2) Freezers.
(3) Dishwashers.
(4) Clothes dryers.
(5) Water heaters.
(6) Room air-conditioners.
(7) Home heating equipment, not including furnaces.
(8) Television sets.
(9) Kitchen ranges and ovens.
(10) Clothes washers.
(11) Humidifiers and dehumidifiers.
(12) Central air-conditioners.
(13) Furnaces.

DOE hereby amends title 10, chapter II, Part 430, Code of Federal Regulations, to prescribe energy efficiency improvement targets for water heaters, home heating equipment (not including furnaces), kitchen ranges and ovens, clothes washers, and furnaces. A target for furnaces was proposed by FEA on September 23, 1977 (42 FR 52426, September 30, 1977), and a public hearing was held on November 8, 1977. Targets for the other four product types covered by today's rulemaking were proposed by FEA on July 8, 1977 (42 FR 36648, July 15, 1977), and public hearings were held August 16-19, 1977. Final efficiency targets for all other product types listed above were previously issued on April 5, 1978 (43 FR 15138, April 11, 1978).

The targets for product types (1) through (10) above are required by section 325 to be designed so that, if met, the aggregate energy efficiency of all such products which are manufactured in 1980 will exceed the aggregate energy efficiency of all such products manufactured in 1972 by the maximum percentage improvement which DOE determines to be economically and technologically feasible, but which in any case is not less than 20 percent. Targets for products (11) through (13) are required to be designed so as to achieve the maximum improvement in energy efficiency determined by DOE to be technologically and economically feasible by 1980.

Analysis leading to the establishment of the targets was accomplished in three stages. First, potential energy efficiency improvement design options for each product type were identified and then analyzed to determine whether they were technologically feasible. The energy savings of individual design options were combined to provide a single target for each product. In the second stage, the economic feasibility of the energy efficiency targets calculated in the first stage was evaluated. In the third stage the individual product type targets for products (1) through (10) were combined to determine the aggregate energy efficiency improvement of those product types manufactured in 1980 as compared with the aggregate energy efficiency of those product types manufactured in 1972.

As described earlier, section 325 requires that the aggregate energy efficiency improvement for product types (1) through (10) be at least 20 percent above the 1972 base year efficiency. Four of the targets prescribed today fall within this category. These four targets, when combined with the other six pertinent targets prescribed on April 5, 1978, amount to a 26.4-percent energy efficiency improvement for product types (1) through (10), so that the 20-percent aggregate requirement of section 325 is met.

As envisioned by the Act, the appliance program is responsible for encouraging manufacturers to produce, and consumers to purchase, significantly more efficient appliances by 1980. The Act sets forth two interrelated strategies for accomplishing this objective.

The first is to establish voluntary efficiency improvement targets representing aggregate industry-wide levels of efficiency improvement to be achieved by 1980. As an incentive for the industry to reach these targets, a reporting and monitoring system will be established to track industry progress. In the event that achievement of any target appears unlikely, this system will require DOE to initiate an administrative proceeding to prescribe a mandatory minimum efficiency standard for the product in question.

The second strategy entails development of a labeling program to require that manufacturers label each product with energy information to allow consumer comparisons. The Federal Trade Commission (FTC) is charged with responsibility for establishing labeling rules and administering the labeling program.

In conjunction with issuance of the labeling rules, a consumer education effort will enhance consumer awareness of the labels and create a better understanding of the information provided on the labels. This is intended to encourage comparison shopping and to enhance consumer demand for the more efficient products. As a consequence, it is anticipated that manufacturers will be influenced to expedite efficiency improvements for their various product lines to meet market demand.

In order to support these dual strategies, section 323 of the Act requires that DOE develop test procedures for each covered product for the determination of estimated annual energy costs and at least one other measure of energy consumption which will assist consumers in making purchasing decisions. The test procedures, when applied to individual manufacturers'

[1] Editorial Note.It is contemplated that ch. II will be renamed at a future date to reflect the fact that it contains regulations administered by the Department of Energy, including regulations of the appliance program and other regulations administered by the Office of Conservation and Solar Applications.

product lines, will provide comparable data on a variety of energy characteristics of all products covered by a given test procedure. The FTC has proposed that manufacturers apply the test procedures to provide test-related data for FTC product labels and for representations regarding energy consumption. Test procedure design must be flexible enough to allow for technological variation among different product lines, yet standardized enough to assure that each manufacturer's product line will be subject to the same measurement criteria.

An outline of the provisions of subparts A, B, and C of part 430 which have so far been established, including the provisions in today's rulemaking, is as follows:

Subpart A—General Provisions

Sec.
430.1 Purpose and scope.
430.2 Definitions.

Subpart B—Test Procedures

430.21 Purpose and scope.
430.22 Test procedures for measures of energy consumption.
(a) Refrigerators and refrigerator-freezers.
(b) Freezers.
(c) Dishwashers.
(d) Clothes dryers.
(e) Water heaters.
(f) Room air-conditioners.
(g) Unvented home heating equipment.
(h) Television sets.
(i) Kitchen ranges and ovens.
(j) Clothes washers.
(k) Humidifiers.
(l) Dehumidifiers.
(m) Central air-conditioners.
(n) Furnaces.
(o) Vented home heating equipment.
430.23 Units to be tested [Reserved].
430.24 Representations regarding measures of energy consumption.[2]
(a) Refrigerators and refrigerator-freezers.
(b) Freezers.
(c) Dishwashers.
(d) Clothes dryers.
(e) Water heaters.
(f) Room air-conditioners.
(g) Unvented home heating equipment.
(h) Television sets.
(i) Kitchen ranges and ovens.
(j) Clothes washers.
(k) Humidifiers.
(l) Dehumidifiers.
(m) Central air-conditioners.
(n) Furnaces.
(o) Vented home heating equipment.

APPENDICES TO SUBPART B

Appendix A1—Uniform test method for measuring the energy consumption of electric refrigerators and electric refrigerator-freezers.

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Appendix B—Uniform test method for measuring the energy consumption of freezers.
Appendix C—Uniform test method for measuring the energy consumption of dishwashers.
Appendix D—Uniform test method for measuring the energy consumption of clothes dryers.
Appendix E—Uniform test method for measuring the energy consumption of water heaters.
Appendix F—Uniform test method for measuring the energy consumption of room air-conditioners.
Appendix G—Uniform test method for measuring the energy consumption of unvented home heating equipment.
Appendix H—Uniform test method for measuring the energy consumption of television sets.
Appendix I—Uniform test method for measuring the energy consumption of conventional ranges, conventional cooking tops, conventional ovens, microwave ovens, and microwave/convention ranges.
Appendix J—Uniform test method for measuring the energy consumption of clothes washers.
Appendix K1—Uniform test method for measuring the energy consumption of central system humidifiers.
Appendix K2—Uniform test method for measuring the energy consumption of room humidifiers.
Appendix L—Uniform test method for measuring the energy consumption of dehumidifiers.
Appendix M—Uniform test method for measuring the energy consumption of central air-conditioners.
Appendix N—Uniform test method for measuring the energy consumption of furnaces.
Appendix O—Uniform test method for measuring the energy consumption of vented home heating equipment.

Subpart C—Energy Efficiency Improvement Targets

430.31 Purpose and scope.
430.32 Energy efficiency improvement targets.
(a) Refrigerators and refrigerator-freezers.
(b) Freezers.
(c) Dishwashers.
(d) Clothes dryers.
(e) Water heaters.
(f) Room air conditioners.
(g) Home heating equipment (not including furnaces).
(h) Television sets.
(i) Kitchen ranges and ovens.
(j) Clothes washers.
(k) Humidifiers.
(l) Dehumidifiers.
(m) Central air-conditioners.
(n) Furnaces.

II. FINAL TARGET DETERMINATIONS AND DISCUSSION OF COMMENTS

After careful consideration of the oral and written comments received in response to the proposed targets, DOE is today prescribing the following targets (proposed targets which differed from the targets prescribed today are noted in parentheses):

[Figures in percent]

Water heaters	23	
Home heating equipment (not including furnaces)	11	(13)
Kitchen ranges and ovens	40	(64)
Clothes washers	35	(47)
Furnaces	20	(23)

Major comments received regarding these targets are summarized and discussed below. To avoid confusion in the discussion of comments, "DOE" is used throughout even though activities prior to October 1, 1977, regarding this rule were conducted by FEA. For a detailed explanation of the technological and economic methodologies used to arrive at the targets, refer to the FEDERAL REGISTERS of July 15, 1977 (42 FR 36648, July 15, 1977) for the first four product types listed above and September 30, 1977 (42 FR 52426, September 30, 1977) for furnaces. Revised economic and technical background papers as well as a microeconomic analysis for each product affected by today's action are available for inspection in the DOE Freedom of Information Office, Room 2107, Federal Building, 12th and Pennsylvania Avenue NW., Washington, D.C., between the hours of 8 a.m. and 4:30 p.m., Monday through Friday.

A. WATER HEATERS

DOE has determined that the proposed efficiency improvement target of 23 percent for water heaters is the maximum improvement which is technologically and economically feasible. Table 1 summarizes the final efficiency improvement target and associated energy factors.

1. *On/off switches for electric water heaters.* A comment suggested that DOE should include, in its list of design options for electric water heaters, a switch which would allow the user to turn the water heater on or off at will. Also suggested was a variation of this design option which would allow the on/off switch to be located away from the electric water heater.

NBS has investigated the energy saving potential of an on/off switch, often referred to as a "vacation switch," for water heaters. The results of that investigation show that such a switch provides no significant energy savings unless the water heater is turned off for an extended period, such as several days or more. Because such long "off" periods are not typical of national water heater usage patterns, DOE is presently unable to estimate the potential energy savings, if any, of this design option, or to draw any conclusions regarding its usefulness and feasibility.

[2] DOE is currently proposing to delete § 430.24 and to establish a new § 430.23, in order to prescribe statistical sampling provisions applicable to any testing required under the Act relating to representations respecting the energy consumption of, or cost of energy consumed by appliances and relating to the labeling of appliances (43 FR 40192, Sept. 8, 1978).

TABLE 1.—*Water Heater Energy Efficiency Improvement Target*

	1972 energy consumption × 10^{12} Btu	Energy savings (percent)	Energy efficiency improvement target (percent)	1972 energy factor (percent)	1980 energy factor (percent)
Water heaters	176.9	19	23		
Electric	49.6	15	18	80	94
Gas	125.6	20	25	44	55
Oil	1.7	17	20	46	55

2. *Oil water heater exemption from targets.* Comments from oil water heater manufacturers requested that oil water heaters be exempted from the target program on the ground that a target would result in the deterioration of the oil water heater industry. Comments cited the small-business nature of the oil water heater industry and expressed concern about the industry's ability to undertake the necessary investment to improve efficiency.

DOE is aware that many oil water heater manufacturers are small businesses which lack extensive research and development facilities and resources. DOE is also aware that some individual manufacturers may have limited access to the investment capital necessary for the implementation of the energy-saving design options. However, based on currently available information, DOE has determined that certain of the design improvements applicable to oil water heaters can be implemented by 1980, and that the oil water heater industry is able to undertake the investment necessary to implement these design changes.

3. *Improved heat transfer for oil water heaters.* Some comments stated that, in order to improve heat transfer for oil water heaters, combustion chambers and flue-ways would have to be redesigned, requiring extensive engineering and testing programs. These comments stated that the leadtime for the implementation of this design option would be at least 5 years, rather than the 1 year estimated by DOE.

In the case of oil water heaters, DOE analysis indicated that only center-flue type oil water heaters offered a potential for saving energy through improved heat transfer. DOE determined that redesign of the flue baffling of this category of oil water heaters would yield a 3.8-percent energy savings for these water heaters alone. Since only 35 percent of the oil water heaters produced in 1972 were of the center-flue type, the production-weighted energy savings for all oil water heaters attributable to improved heat transfer is 1.3 percent.

DOE, after reviewing this matter, finds that the 1.3-percent energy savings associated with the improved heat transfer design option for oil water heaters can in fact be achieved by redesigning the flue baffling of center-flue type oil water heaters alone. Further, DOE finds that the specified energy savings can be achieved without redesigning the combustion chambers of any oil water heaters. Since no information was received which would substantiate a contrary conclusion, DOE believes that this design option may feasibly be implemented by 1980.

4. *Insulation improvements or additions.* Some comments stated that water heater manufacturers are currently receiving shipments of insulation from suppliers on a fixed allotment basis and that manufacturers are unable to procure additional insulation. Comments further stated that because of these constraints, manufacturers of water heaters will be unable to achieve the 8-percent energy savings which DOE attributed to this design option and, hence, would be unable to meet the 1980 energy efficiency target.

DOE has evaluated the availability of various types of insulation materials which may be used to insulate water heaters. While water heater manufacturers have operated under some form of allocation system with regard to the purchase of insulation materials, it appears that sufficient supplies of the appropriate kinds of insulation will be available so as not to jeopardize achievement of the target in 1980. A major producer of water heater insulation has indicated to DOE that the increased demand which could result from the implementation of this design option can and will be met by insulation manufacturers. Recent analyses conducted by independent industry experts support this view. DOE concludes that sufficient supplies of the appropriate kinds of insulation materials will be available to water heater manufacturers and that no change in the energy savings associated with this design option is warranted.

One comment suggested that the increased or improved insulation design option would require a redesign of oil water heater insulation jackets. This comment stated that the implementation of this design option would constitute a major change in production, requiring a leadtime of 5 years rather than the 2 years estimated by DOE.

DOE finds that some oil water heater manufacturers would have to redesign the jackets of oil water heaters to accommodate additional insulation material if they choose to increase the amount of insulation rather than to use an improved quality of insulation to achieve the 8-percent energy savings associated with the increased or improved insulation design option. DOE does not, however, have any basis for modifying this design option for oil water heaters, especially in view of the fact that the same design option can be implemented by 1980 for gas and electric water heaters.

An additional comment expressed concern about the possible fire hazard posed by the use of foam insulation in water heaters, and about foam insulation shrinkage over time. The 8-percent energy savings which DOE associated with the increased or improved insulation design option for water heaters was not predicated on the use of foam insulation. DOE finds that this energy savings can be achieved by increasing the thickness of the insulation presently used in some water heaters or through the use of an insulation material other than foam which has a lower thermal conductivity per unit thickness than that currently used on oil water heaters. DOE does not find the possible unsuitability of foam insulation for water heater applications to be grounds for modifying this design option.

5. *Heat traps for oil water heaters.* Commenters generally agreed with DOE's estimate that the heat trap design option could yield a 1-percent production-weighted energy savings, but stated that the leadtime associated with this design option would be 5 years in order that appropriate field design evaluations could be made. DOE has determined that the adoption of the heat trap design option involves only a change in the configuration of the inlet and outlet water supply piping of oil water heaters. It does not necessitate the redesign of any aspect of oil water heaters because heat traps can be readily attached to the inlet and outlet water supply pipe connections of present models. Therefore, DOE finds that it is feasible to implement the heat trap

feature into the design of oil water heaters by 1980.

6. *Ignition system improvement for oil water heaters.* Comments questioned DOE's estimate that 2.0 percent of the total energy consumed by an oil water heater could be saved by improving the ignition system. Upon reexamination of its technical analysis for this design option, DOE finds that a mathematical error led DOE to overestimate the energy savings associated with the design option. DOE now finds that although the design option can achieve a 38-percent savings in electrical energy consumption, it will result in only a 0.3-percent reduction in the total energy consumption of an oil water heater. The lifetime cost savings associated with this energy savings is estimated to be $9 in current dollars. The estimated increase in the retail cost of oil water heaters with this design option is zero, since the cost of the new ignition system is estimated to be the same as that of the ignition system it would replace. No new tooling costs or increases in labor costs are projected. Therefore, while DOE's claim of a 2-percent energy savings for this design option was erroneous and has been corrected to 0.3 percent, the design option will save energy and is cost-effective.

Table 1 reflects the reduction in the aggregate energy savings for oil water heaters (from 19 percent to 17 percent) attributable to reducing the energy savings associated with the ignition system improvement design option from 2.0 percent to 0.3 percent. The individual oil water heater energy efficiency improvement percentage and 1980 energy factor values which are presented in table 1 were reduced from their proposed values for the same reason; from 23 percent to 20 percent in the case of efficiency improvement, and from 56.6 percent to 55 percent in the case of the 1980 energy factor. These changes had a negligible effect on the aggregate energy savings and the final energy efficiency improvement target for water heaters because oil water heaters account for a very small share of the water heater market.

Further comments concerning this design option stated that a new ignition system would require extensive testing to insure that it would not pose a reliability problem. After analysis, DOE has determined that there is no reason to presume at this time that the improved ignition systems currently being developed for oil-fueled appliances cannot be adequately tested for reliability prior to incorporation into production units by 1980.

7. *Pilot elimination.* One commenter objected to any energy efficiency improvement design option for water heaters which would call for the elimination of the pilot in LP-gas water heaters. DOE did not identify the elimination of pilots in either LP or natural gas water heaters as an energy efficiency improvement design option, and the target for water heaters does not include the elimination of the pilot.

8. *Cost increases.* One commenter stated that the price increase associated with producing more energy-efficient gas water heaters, excluding the heat trap design, would be $25 to $35 per unit. DOE believes that a figure of $9 to $10.15 per unit is most likely. Even at the commenter's highest estimated price increase of $35 excluding the heat trap design option, the implementation of all design options for gas water heaters would be economically feasible because of the significant amount of energy savings attributable to the more efficient design options.

B. HOME HEATING EQUIPMENT, NOT INCLUDING FURNACES

DOE has determined that for home heating equipment (not including furnaces) an efficiency improvement target of 11 percent is the maximum improvement which is technologically and economically feasible. Analysis of the comments and information received in response to the proposal resulted in an increase of the possible energy savings for gas-fueled vented heaters from the proposed 12 percent to 14 percent, and thus increased the efficiency improvement percentage for all vented heaters from the proposed 13 percent to 15 percent. There were no changes made to the proposed energy savings for oil-fueled vented heaters. Unvented home heating equipment is considered 100 percent efficient at the point of use, and the maximum feasible efficiency improvement for unvented heaters is therefore 0 percent. Unvented heaters were mistakenly excluded from the calculation of the target for home heating equipment (not including furnaces) in the proposal. Recalculation of the target to include unvented heaters has resulted in a reduction of the target from 15 percent to 11 percent. Table 2 summarizes the final efficiency improvement target and the associated energy factors for home heating equipment (not including furnaces).

TABLE 2.—*Home Heating Equipment (Not Including Furnaces) Energy Efficiency Improvement Target*

	1972 energy consumption $\times 10^{12}$ Btu	Energy savings (percent)	Energy efficiency improvement target (percent)	1972 energy factor (percent)	1980 energy factor (percent)
Home heating equipment (aggregate)	38.67	10	11	.....	.....
Vented home heating equipment (aggregate).	30.63	13	15	.....	.....
Gas heater	22.40	14	16	53	61.3
Oil heater	8.23	11	12	41	45.8
Unvented home heating equipment	8.04	0	0	100	100

1. *Electric ignition and reduced pilot.* One comment stated that only a small number of gas-fueled vented heaters would ever be sold with electric ignition because most heaters in this category are not amenable to connection with an electrical supply. The proposal anticipated that half of the forced air gas-fueled vented heaters, or 11 percent of all gas vented heaters, could be equipped with electric ignition.

Based on data submitted by the commenter, DOE has reduced the number of gas-fueled vented heaters to be equipped with electric ignition from 11 percent to 9 percent. This represents a decrease in the estimate of the population of forced air gas-fueled vented heaters from 22 percent to 18 percent of all gas-fueled vented heaters.

This commenter also stated that the retail price increase of $45 for electric ignition cited in the proposal was too low. A $100 to $125 price increase was suggested, but no substantiation of this estimate was provided. After careful review of the retail price increase estimate and after consideration of the fact that furnaces are currently being sold with a similar electric ignition for a premium of $60, DOE has revised its retail price estimate upward to $60. A price increase of $60, which translates to a production-weighted price increase of $5.40, has been determined by DOE to be economically feasible. The payback period to the consumer for purchasing a unit with electric ignition is estimated to be 6½ years.

As an alternative to electric ignition, manufacturers might also reduce pilot input in order to eliminate some of the energy waste associated with the continuously burning pilot. Preliminary data submitted by NBS have shown energy savings from reduced pilot input to be about 5 percent for all gas-fueled vented heaters, compared to 1 percent for electric ignition in those products which are amenable to electric ignition. Data regarding this option are presently insufficient, however, to determine its feasibility for purposes of the target program.

2. *Improved heat transfer.* One commenter stated that the improved heat transfer design option is not feasible for gravity gas-fueled wall heaters. The reason given for this view was that forced convection, implicit in this design option, is not economically feasible in light of the cost of fitting such units for connection with an electrical supply. DOE agrees with this point and has also determined that improving heat transfer by derating the burner and rebaffling the heat exchanger also does not appear to be feasible since gravity circulation must be maintained in these units. Therefore, DOE has eliminated gravity gas-fueled wall heaters from the production-weighted energy saving for this design option. As a result, the production-weighted energy savings for improved heat transfer in all gas-fueled vented heaters has been reduced from the proposed 7.6 percent to 4.9 percent.

3. *Stack damper.* In the proposal DOE estimated that 18 percent of gas-fueled vented heaters and 15 percent of oil-fueled vented heaters would incorporate electric stack dampers in 1980 production. Comments objected to the inclusion of the stack damper design option in the target because they doubted the economic feasibility of equipping relatively inexpensive home heating equipment with costly electric stack dampers.

The final target is based on the application of less expensive thermal stack dampers for gas-fueled vented heaters. These thermal dampers, with their relatively low cost and independence from electrical supply requirements, are considered by DOE to be applicable to all gas-fueled vented heaters except those with direct vent systems. At the time of the proposal there was doubt as to the feasibility of incorporating thermal dampers in 1980 production because little work had been done on a national safety standard for thermal dampers. Since the time of the proposed rulemaking substantial progress has been made on a national standard for thermal dampers and DOE anticipates that this design option can be implemented in the 1980 production.

Because thermal dampers are typically loose fitting, compared to electric dampers, DOE's technical analysis has led to a reduction in the estimated energy savings attributed to a stack damper from the proposed 13 percent for the tighter fitting electric damper to the final 9 percent for the thermal damper. However, the final production-weighted energy savings is now 7.7 percent for gas-fueled vented heaters, rather than the proposed 3.5 percent, because it is technologically and economically feasible to apply the thermal damper to all gas-fueled vented heaters except those with direct vent systems.

NBS believes the applicability of thermal dampers to oil-fueled heaters is questionable since carbon deposits may render the damper inoperable. Therefore, the electric stack damper option remains as proposed for oil-fueled vented heaters.

4. *Baseline data.* One commenter stated that the annual usage estimates relied upon by DOE were "merely guesstimates" and that more data should be accumulated in order to refine these estimates. However, the annual usage data submitted by this same commenter is in close agreement with the NBS estimates relied upon by DOE. For this reason, DOE continues to accept the NBS figures.

5. *Low-income groups.* One commenter stated that low-income groups would not be able to purchase the more efficient but more expensive home heating appliances contemplated by the proposed target.

DOE accounted for the possible negative impact on low-income purchasers in the proposed target for home heating equipment by production-weighting the individual design options included in 1980 shipments, and believes that the production-weighting insures that low-income purchasers, who account for 42 percent of the market, will have available for purchase more efficient home heating equipment at minimal increases in price. In researching the issue of low-income consumers DOE assumed that low-income persons purchasing appliances were homeowners rather than renters, and DOE therefore used the 1976 annual housing survey, published by the Bureau of Census and the Department of Housing and Urban Development, to determine the portion of the home heating equipment market that falls into the low-income category. The 1976 Bureau of Census definition for the annual poverty level income of a family of four is $5,815. In determining low-income homeowners DOE included families who earned up to $7,000. This has been done to account for those homeowners who earn more than the poverty level income, but might still encounter financial difficulties when faced with a substantial increase in the price of an essential appliance.

6. *1980 shipment estimates.* One commenter questioned the accuracy of DOE's estimates of 1980 shipments of gas-fueled vented home heating equipment. After review of past industry shipments, both before and after 1972, DOE believes that the base year of 1972 was an unusually strong year for the home heating industry. The historical trend indicates that replacement demand in 1980 will be closer to 500,000 units, rather than the 700,000 units previously forecast by DOE. The lower shipment forecast of 500,000 units in 1980 does not affect the economic feasibility of the target for gas-fueled vented home heaters because the attendant costs and benefits were reduced commensurately as a result of this revision. The revised forecast also has a minimal effect on the negative impacts described in stage IV of the economic analysis section of the proposed target notice (42 FR 35657, July 15, 1977).

C. KITCHEN RANGES AND OVENS

DOE has determined that an efficiency improvement target of 40 percent for kitchen ranges and ovens is the maximum improvement which is technologically and economically feasible. Analysis of the comments received indicates that in the proposal DOE overestimated the energy savings of several of the design options. As a result of this analysis, the estimated aggregate energy savings has been adjusted from 39 percent to 29 percent, and the efficiency improvement target has been adjusted from the proposed 64 percent to 40 percent. Table 3 summarizes the final efficiency target and associated energy factors.

1. *Baseline data for 1972.* Several comments questioned the accuracy of the 1972 energy consumption baseline data used in arriving at the proposed target. The initial NBS target recommendations used the best available data and estimates for the 1972 base period. In February 1978, the Association of Home Appliance Manufacturers (AHAM) furnished DOE with revised 1972 base year energy consumption and efficiency data for conventional electric ovens, cooking tops, and ranges. These new data generally confirmed the estimates in the proposal. Since these data reflect the final DOE test procedure calculations, however, this new material has been used to adjust the 1972 base year energy consumption.

TABLE 3.—*Kitchen Ranges and Ovens Energy Efficiency Improvement Target*

	1972 energy consumption $\times 10^{12}$ Btu	Energy savings (percent)	Energy efficiency improvement target (percent)	1972 energy factor (percent)	1980 energy factor (percent)
Kitchens ranges and ovens	32.24	29	40		
Electric ranges/ovens	8.43	3	3		
Ranges	7.37	3	3	43.57	44.69
Cooking tops	.54	0	0	74.84	74.84
Ovens	.52	4	4	12.99	13.53
Gas ranges/ovens	23.71	38	62		
Ranges	22.01	38	62	12.43	20.12
Cooking tops	.83	42	72	21.40	36.80
Ovens	.87	35	53	3.58	5.48
Microwave ovens	.10	5	5	38.00	39.90

For gas-fueled conventional ovens, cooking tops, and ranges, the 1972 base year energy consumption and cooking efficiency data have been revised based on NBS's analysis of American Gas Association Research Report No. 1510 and additional data furnished in January 1978 by the Gas Appliance Manufacturer's Association. No change in the final target for kitchen ranges and ovens was required as a result of the baseline revisions.

2. *Energy factor.* The method of calculating the energy factor for kitchen ranges and ovens was modified in the final test procedures for kitchen ranges and ovens, 10 CFR 430.22(i)(4) (43 FR 20108, May 10, 1978). Although the target prescribed today is not affected by this modification, both the 1972 and 1980 energy factors listed in table 3 have been adjusted to reflect the changes in the final test procedures. The modifications to the energy factor, as noted above, are discussed in detail in the technical background paper for kitchen ranges and ovens available in the DOE Freedom of Information Office.

3. *Elimination of standing pilots.* One manufacturer suggested that the elimination of standing pilot lights from gas ranges would save 33 to 40 percent of the total energy consumed by these appliances, rather than the 47-percent savings estimated by DOE. Based upon its own measurements of the pilot energy consumption of typical gas ranges, and evaluation of data from the American Gas Association laboratories and other sources, NBS has determined that the previous estimate was too high, but that a 40-percent energy savings is attainable. DOE accepts this determination.

Several comments requested that the target be adjusted to permit pilot lights for those products which are fueled by propane. These comments suggested that electric ignition devices are unsafe for such products because propane, being heavier than air, will tend to collect in low places, with a risk of explosion. It was also suggested that the use of matches to light burners on those occasions in which the electric ignition is not operational, presents a safety problem.

The American Gas Association tests gas-fueled kitchen ranges and ovens, including those having electrical ignition systems, and certifies that such products comply with national safety standards as specified in the American National Standard (ANS-Z21.1-1974 and its amendment ANS-Z21.1a-1974, section 2.7). This standard makes no distinction between the safety requirements of ignition systems designed for use with propane and those designed for use with natural gas. Kitchen ranges and ovens are currently manufactured which are convertible between natural gas and propane and which also have electric ignition devices.

Several comments called attention to the possibility that elimination of the standing pilot in those ovens and ranges purchased by low-income consumers would be unduly burdensome. It was claimed that lower income groups tend to purchase lower priced ranges which require no electrical power for operation. In some cases, low-income households either have no electrical service or are located in remote areas with undependable electrical service. It was also noted that the use of electric ignition could require additional wiring in some homes to provide an electrical outlet for the range at a cost of about $150.

After review of the comments and analysis of existing market data, DOE has determined that the design option for electric ignition in natural gas and LP-gas ranges which require no electrical power for operation is not economically feasible for low-income consumers. Based on DOE estimates of the number of low-Income households, households without properly located electrical outlets, and the number of households with poor or no electrical service, DOE has found it necessary to reduce the production-weighting of the design option for the elimination of standing pilot on gas ranges and ovens by 10 percent, from 100 percent to 90 percent. This in turn, reduces the production-weighted energy saving from 40 percent to 36 percent for this design option.

4. *Reduction of excess flue gas losses.* Several comments addressed the design option to reduce excess flue gas losses. In the proposal DOE estimated that 100 percent of 1980 shipments could incorporate this design option. One manufacturer commented that it could not achieve the projected energy savings because excess flue gas losses had already been reduced on its products prior to 1972. DOE now finds that excess flue losses had already been sufficiently reduced for 16 percent of all gas ranges manufactured in 1972. As a consequence, the 1972 production-weighting for this design option has been increased from 0 to 16 percent, and thus, the production-weighted energy savings is correspondingly lower.

Comments from manufacturers also stated that this design option, which DOE estimated would result in an energy savings of 4 percent, is technologically infeasible for ovens smaller than standard size ovens and for ovens which incorporate a broiler in the main oven cavity (referred to as "dual cavity-type ovens" in the hearing comments). Manufacturers further claimed that the inclusion of "dual cavity-type ovens" as part of this target could cause their elimination from the marketplace. DOE reiterates that the efficiency improvement target for kitchen ranges and ovens is applicable not to particular units but to the aggregate energy efficiency of all units, and no adjustment to the target has been made as a result of this comment. It should be noted, however, that even if the design option had been determined to be technologically infeasible for the products in question, no change would result in the final target for kitchen ranges and ovens because these products occupy such a small percentage of the market.

In the proposal the energy savings for reducing excess flue gas losses was based on the carbon dioxide (CO_2) levels measured in the flue gases during maintenance of oven temperature. During the review and analysis process, NBS discovered this method of measurement to be in error. NBS has reexamined the conditions under which the CO_2 should be measured, and has determined that the average CO_2 content should be measured during heatup, when the burner is on continuously, rather than during temperature maintenance, when the burner is on only intermittently. This change in the method of measurement has reduced the energy savings for reduction of excess flue gas losses for gas ranges from 4 percent to 2 percent.

One commenter, the Gas Appliance Manufacturers Association, questioned DOE's initial estimate of the investment requirements needed to implement this same design option, suggesting that the true figure would be

$200,000 per manufacturer rather than zero, as suggested by DOE. DOE accepts the GAMA estimate of capital investment, which translates to a retail price increase of $3 per unit. This level of investment remains economically feasible in light of the investment capability of the industry, and the negligible demand impact of a $3 price increase.

5. *Improved insulation.* One consumer questioned the availability of additional insulation material in 1980. DOE has investigated this matter and has concluded that in 1980 the fiberglass industry will be able to meet all foreseeable needs of appliance manufacturers.

In the proposal, DOE estimated that insulation could be improved in 100 percent of the non-self-cleaning ovens by increasing either the quantity or the quality of insulation material. Comments indicated, and DOE now agrees, that replacement of fiberglass insulation with higher quality insulation would not be technologically feasible by 1980.

Several comments further stated that in certain instances manufacturers would be unable, without retooling, to increase the quantity of insulation in their products. NBS has reviewed these comments, as well as additional available information, and concludes that 30 percent of the non-self-cleaning ovens are amenable to greater insulation without retooling.

Comments further indicated that in certain instances where retooling was necessary, the capital investment would be economically prohibitive. According to NBS estimates, 70 percent of non-self-cleaning ovens would require retooling in order to improve insulation substantially. After reviewing the industry structure, DOE has determined that it would be economically feasible for manufacturers having 10 percent or more of the market share to retool in order to increase insulation. Firms of this size account for approximately 70 percent of the market for kitchen ranges and ovens. This 70-percent market share for large manufacturers, multiplied by the 70 percent of non-self-cleaning ovens for which retooling would be necessary in the first place, yields approximately 49 percent of non-self-cleaning ovens which could feasibly be improved if retooling were undertaken. Added to the 30 percent of non-self-cleaning ovens which can be improved without retooling, this design option is economically feasible for approximately 79 percent of the non-self-cleaning ovens manufactured in 1980, compared to the 100 percent previously proposed by DOE. The production-weighted energy savings for this design option is proportionately reduced from 6 percent to 5 percent.

6. *Adjustment of energy savings due to safety regulations.* In the proposed targets the estimated percentage of energy savings for electric kitchen ranges and ovens included a 1-percent adjustment because of design changes made by manufacturers since 1972 to meet various new safety requirements. One commenter requested that a similar adjustment be made for gas kitchen ranges and ovens. No information was provided relating to the impact of new safety requirements upon the efficiency of gas ranges and ovens since 1972, and information available to DOE indicates that the impact of new safety requirements for gas ranges and ovens is negligible in terms of the final target.

7. *Ranges and ovens in mobile homes and recreational vehicles.* One comment requested that recreational vehicle ranges and ovens be excluded from the target program, because they are not used in residences, and are subject to entirely different consumer usage patterns. The comment also requested that ranges in mobile homes be excluded because such units are subject to regulations promulgated by the Department of Housing and Urban Development (HUD).

Ranges and ovens used in recreational behicles and in mobile homes fall within the definition of "Kitchen Ranges and Ovens" in 10 CFR 430.2 (43 FR 20108, May 10, 1978) and are therefore included in the target program. Further, DOE, in prescribing an energy efficiency improvement target, does not consider it relevant that the products are regulated for purposes other than energy efficiency by another Federal agency.

D. CLOTHES WASHERS

DOE has determined that an efficiency improvement target of 35 percent for clothes washers is the maximum improvement which is technologically and economically feasible. Analysis of the comments resulted in lowering the estimate of the energy savings for one design option related to reducing the water temperature of the wash cycle. Consequently, total energy savings have been reduced from 32 percent to 26 percent, and the efficiency improvement target has been reduced from 47 percent to 35 percent. Table 4 summarizes the final energy efficiency improvement target and associated energy factors.

TABLE 4.—Clothes Washer Energy Efficiency Improvement Target

Energy efficiency improvement target (percent)	35
1972 energy factor (cubic feet/kilowatt-hour)	0.65
1980 energy factor (cubic feet/kilowatt-hour)	0.88

1. *Resubmission of baseline data.* A comment by the Association of Home Appliance Manufacturers (AHAM) stated the need to recalculate the 1972 base year energy consumption, because DOE's final test procedures for clothes washers are different from the test procedures used to establish the 1972 base year data cited by DOE. AHAM offered to supply new data to reestablish the base year energy consumption according to the final test procedures for clothes washers. The clothes washer target is based on this new data. Changes between the proposed and final test procedures also required reestablishing the 1972 base year energy factor in terms of cubic feet per kilowatt-hour, but this energy factor revision did not affect the energy efficiency improvement target.

Another industry comment suggested that the baseline energy consumption data should reflect a 100-percent efficiency for water heating. This has been the method used by DOE to calculate the baseline consumption. Details of the baseline calculation are provided in the technical background paper for clothes washers available in the DOE Freedom of Information Office.

2. *Eliminate warm rinse.* One comment stated that more motor torque would be required to agitate clothes in cold water, suggesting the need for the development of higher torque motors at increased costs, but no supporting evidence was provided to support this claim. Testing by NBS has revealed no evidence of any measurable variation of motor torque as the temperature of the rinse water is changed from warm to cold. Therefore, no revision to the energy efficiency improvement target has been made as a result of this comment.

One comment stated that some customers who are accustomed to warm water rinsing may not accept clothes washers without this feature. However, most of the comments agreed that DOE's estimate of the energy savings resulting from elimination of the warm rinse option is reasonable and achievable. There were no major concerns over any significant reduction in performance as a result of using all cold water rinses, and laboratory test data confirms that there are no significant performance differences between warm and cold rinses. Further, DOE believes that government and industry consumer education efforts will mitigate any potential negative consumer reaction to this design option.

3. *Reduce warm water wash temperature setting.* One energy saving option proposed by DOE for clothes washers was a 40/60 water mixing valve which would provide warm water by combining 40 percent hot water with 60 percent cold water. Industry

representatives expressed concern that the reduced wash/water temperature would produce unsatisfactory washability performance and would reduce bacterial elimination, which is important in winter months in regions with colder climates. In addition, comments suggested that consumers might utilize a hot water wash cycle more often, because the new warm mix might appear cool to the touch.

Subsequent analysis by DOE indicated that due to the variability of cold water inlet temperatures, the 40/60 valve could produce unacceptable performance in the colder regions of the country. Therefore, DOE recommends a warm water mixture of 50 percent hot water and 50 percent cold water. DOE believes that this will provide acceptable year-round performance, and that consumer usage patterns will not be altered significantly as a result of this design option. Currently available information indicates that the inclusion of a 50/50 valve will not significantly affect a washer's ability to remove bacteria.

The energy savings attributed to this design option has been recalculated to reflect a hot/cold water mix ratio of 50 percent hot and 50 percent cold. The revised production-weighted energy savings has been reduced from 8.0 percent in the proposal to 2.3 percent for this design option. The energy savings reduction in this case is very large because many of the products produced in 1972 incorporated a 50/50 valve and there will be no savings attributable to this design option for these products in 1980.

E. FURNACES

DOE has determined that an efficiency improvement target of 20 percent for furnaces is the maximum improvement which is technologically and economically feasible. Analysis of the comments received showed that practical limitations of the implementation of the design option calling for improved heat transfer of cast iron boilers reduced the aggregate energy savings for gas and oil boilers from 5 to 1.0 percent. Further, the aggregate energy savings for the improved heat transfer and electric ignition design options was reduced by 15 percent from 9.3 to 7.9 percent to account for potential negative impacts on low-income consumers resulting from retail price increases. Consequently, the efficiency improvement target for furnaces has been reduced from the proposed 23 percent to 20 percent. Table 5 summarizes the final efficiency improvement target and the associated annual fuel utilization efficiencies.

TABLE 5.—*Furnace and Boiler Efficiency Improvement Target*

	1975 energy consumption $\times 10^{12}$ Btu	Energy savings (percent)	Energy efficiency improvement target (percent)	1975 annual fuel utilization efficiency (percent)	1980 annual fuel utilization efficiency (percent)
Furnaces and boilers	147.3	17	20		
Gas boilers and furnaces	122.7	18.0	22	61.5	75.0
Oil boilers and furnaces	24.6	9	10	74	81.4

1. *Improved heat transfer.* Some comments questioned the feasibility of improving the heat transfer characteristics of furnaces and boilers by 1980. These comments stated that such improvements might require the relocation of fan and safety controls, as well as a complete redesign of the heat exchanger. DOE agrees that a major redesign of the heat exchanger section would not be feasible by 1980. However, in the proposal DOE intended that improvement in the heat transfer of furnaces be achieved in 1980 without such redesign, by derating the burner input and baffling airflow through the heat exchanger section. DOE believes that this design option remains both technologically and economically feasible for all furnaces and boilers, except as noted in paragraph 6 below.

2. *Power burner.* In the proposal DOE estimated that 40 percent of gas furnaces could incorporate power burners in 1980 production and that the remaining production could incorporate stack dampers. Both of these design options are effective for minimizing off-cycle losses. Several commenters stated that inclusion of the power burner design option in 1980 products was not feasible. One commenter believed that power burners could be incorporated in some furnace designs by 1980 but that large-scale implementation of power burners was not practicable.

After review of the comments and further analysis of the issue, DOE has modified the production-weighting for power burners and stack dampers and now estimates that 20 percent of gas-fired furnaces could have power 80 percent could incorporate stack burners by 1980 while the remaining dampers. It should be emphasized that the exact mix of these two design options is not important because different mixes of these two design options in 1980 production will also result in achievement of the target.

3. *Stack damper.* Some comments indicated that the estimated energy savings for stack dampers contained in the proposed target was not consistent with values obtained by using the DOE furnace test procedures. DOE has evaluated industry test data developed in accordance with the DOE test procedures for furnaces and boilers, however, and has found close agreement between the industry data and the values of energy savings cited by DOE in the proposed energy efficiency improvement target.

The proposed target was based on incorporation of the electrical-type stack damper in 1980 production. Additional studies conducted by NBS conclude that thermal and mechanical stack dampers will also be available as design options for furnaces manufactured in 1980. Therefore, DOE has included in the final efficiency target a production-weighted mix of 60 percent electrical or mechanical stack dampers and 20 percent thermal stack dampers. This modification does not affect the final target for gas furnaces.

Another comment stated that the energy savings for a stack damper would vary depending on furnace location inside or outside the structure being heated. The basic premise for determining the energy savings of stack dampers for indoor furnaces is that both the heat trapped in the furnace heat exchanger, and the reduced air infiltration through the furnace/chimney system, contribute to reducing the heat load on the furnace system. If a furnace is an outdoor unit or one intended for installation in an unheated area, such as an attic or crawlspace, there is no incentive for manufacturers to install stack dampers because the DOE furnace test procedure does not credit energy savings for a stack damper installed on such a furnace. Therefore, the final target reflects application of stack dampers on indoor furnaces only.

4. *Electric ignition.* One commenter stated that the energy savings of electric ignition devices, as calculated by the proposed DOE furnace test procedures, did not agree with the estimates of such energy savings in the proposed target. Calculations of energy savings for electric ignition using the final DOE furnace test procedures published on May 10, 1978 (43 FR 20147) yield energy savings of about 6 percent, which is also the basis for the energy savings for electric ignition in today's final efficiency target.

5. *Base year data.* Some comments criticized the fact that the 1975 baseline annual fuel utilization efficiencies for furnaces and boilers published in the proposed energy efficiency improvement target for furnaces were only estimates, and were not based on test data. Since the publication of the proposed target, new base year data have been obtained which are based on test data using final DOE test procedures for furnaces and boilers. These data were used to revise the baseline annual fuel utilization efficiencies of furnaces and boilers. The 1975 base year figures are given in Table 5—Furnace Energy Efficiency Improvement Target. These values have been used to derive the target for 1980 annual fuel utilization efficiencies.

6. *Investment.* In the proposal DOE estimated that the investment necessary to meet the target was between $120,000 and $137,000 per manufacturer. Several comments indicated that the magnitude of the investment was much larger and would be economically prohibitive. Of major concern to manufacturers were DOE's investment estimates for improved heat transfer and power burners.

After review of the comments and analysis of additional information DOE now estimates that total investment is $157,000 for each furnace and steel boiler manufacturer and $72,000 for each cast iron boiler manufacturer. The major portion of total investment consists of the two design options mentioned above: Improved heat transfer and power burners. As noted in paragraph 1 above, DOE has made no change regarding the energy savings to be derived from improving heat transfer for furnaces and steel boilers, and the investment associated with this design option remains at $85,000 per firm. For cast iron boilers, improving heat transfer would have required an investment of between $1 million and $1.6 million per manufacturer. This level of investment has been determined to be economically infeasible for cast iron boiler manufacturers, and the production-weighting of the heat transfer design option has been lowered to reflect this determination. This change in production-weighting reduces the energy savings of the design option for gas and oil boilers from 5 to 1 percent, and contributes to the reduction in the final efficiency improvement target summarized in table 5.

In the proposal, the design option for power burners was assumed to require no new investment. After reevaluating this question, DOE now estimates that new investment of approximately $20,000 per manufacturer is likely to be necessary.

Although total investment for all design options supporting the furnace target has been revised to $157,000 per firm ($72,000 for cast iron boiler manufacturers), direct investment undertaken by furnace manufacturers could be as low as $105,000 ($20,000 for cast iron boiler manufacturers), because in many cases a portion of the investment would be incurred by manufacturers' suppliers. This level of investment for furnace manufacturers remains economically feasible.

7. *Retail price.* One comment indicated that the target for furnaces would increase prices to a level that would be burdensome for low- to moderate-income consumers. In reviewing the possible retail price increase that would result from the implementation of the design options, DOE has found that considerable burden could be placed on low-income groups. The average price increase for lower priced gas and oil furnaces could exceed 69 percent and 56 percent, respectively. DOE has found it necessary to reduce by 15 percent the production weights for the improved heat transfer design option for gas and oil furnaces, and the electric ignition design option for gas furnaces, in order to minimize the potential negative impacts on low-income consumers. The change in production weights reduces the aggregate energy savings for these two design options from 9.3 to 7.9 percent and contributes to the reduction in the final efficiency improvement target summarized in table 5.

8. *Elasticity.* One comment questioned DOE's estimate of possible 1980 demand changes resulting from more costly but more efficient boilers. Based on new information supplied by the boiler industry, DOE has revised downward the previous forecast of a demand increase resulting from achievement of the energy improvement target. The possibility of shifts in demand for boilers is constrained by the predominantly replacement-oriented market for these products, the essential nature of heating equipment, and the limited substitutability of other forms of central heating. DOE now estimates that projected demand for boilers will remain relatively constant, and that this steady demand supports the economic feasibility of the target.

9. *LP-gas furnaces.* One comment recommended that the design option for electric ignition be eliminated from the target for furnaces fueled by LP-gas. Several reasons were given for this recommendation. Some areas are not served by electricity, and in some areas where electric service does exist there are often periods of extended interruption. Under these conditions the inability of the electric ignition to function properly results in health and safety hazards. The pilot acts as a safety factor in LP-gas furnaces because, unlike gas ranges, furnaces cycle on and off by thermostatic control, and failure of the electric ignition might not be readily discoverable. This does not present a problem in natural gas furnaces because natural gas is less likely to collect around the furnace and is less energy intensive.

DOE has modified the production weights for the electric ignition design option to exclude LP-gas furnaces. Due to the very small market for these products, however, there is no resulting change in the overall energy savings for the electric ignition design option or the target for furnaces.

This rulemaking complies with DOE's interim prodecures for implementing Executive Order 12044, entitled "Improving Government Regulations."

An economic impact statement including the five targets prescribed today was prepared and is available in the DOE Freedom of Information Office.

(Energy Policy and Conservation Act, Pub. L. 94-163, as amended by Pub. L. 94-385; Federal Energy Administration Act of 1974, Pub. L. 93-275, as amended by Pub. L. 94-385; Department of Energy Organization Act, Pub. L. 95-91; E.O. 12009, 42 FR 46267.)

In consideration of the foregoing, part 430 of chapter II of title 10, Code of Federal Regulations, is amended as set forth below to establish efficiency improvement targets for five appliance types, effective November 13, 1978.

Issued in Washington, D.C., October 5, 1978.

WILLIAM P. DAVIS,
Deputy Director of Administration.

§ 430.32 [Amended]

1. Section 430.32 is amended by adding paragraphs (e), (g), (i), (j), and (n), to read as follows:

* * * * *

(e) The energy efficiency improvement target for water heaters shall be a 23-percent increase in the energy efficiency of the total number of water heaters manufactured by all manufacturers in calendar year 1980 when compared with the energy efficiency of the total number of water heaters manufactured by all manufacturers in calendar year 1972.

* * * * *

(g) The energy efficiency improvement target for home heating equipment (not including furnaces) shall be an 11-percent increase in the energy efficiency of the total number of home heating equipment units (not including furnaces) manufactured by all manufacturers in calendar year 1980 when compared with the energy effi-

ciency of the total number of home heating equipment units (not including furnaces) manufactured by all manufacturers in calendar year 1972.

* * * * *

(i) The energy efficiency improvement target for kitchen ranges and ovens shall be a 40-percent increase in the energy efficiency of the total number of kitchen ranges and ovens manufactured by all manufacturers in calendar year 1980 when compared with the energy efficiency of the total number of kitchen ranges and ovens manufactured by all manufacturers in calendar year 1972.

(j) The energy efficiency improvement target for clothes washers shall be a 35-percent increase in the energy efficiency of the total number of clothes washers manufactured by all manufacturers in calendar year 1980 when compared with the energy efficiency of the total number of clothes washers manufactured by all manufacturers in calendar year 1972.

* * * * *

(n) The energy efficiency improvement target for furnaces shall be a 20-percent increase in the energy efficiency of the total number of furnaces manufactured by all manufacturers in calendar year 1980 when compared with the energy efficiency of the total number of furnaces manufactured by all manufacturers in calendar year 1975.

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